the translation is generally so well done that the work, now that it is completed, cannot but be a boon to the English-reading student.

P.

Heart-Beats in Salpa. — The pulsation of the heart in three species of Mediterranean Salpas has been exhaustively studied by L. S. Schultze.[1] As is well known, the hearts of these animals beat first in one direction and then in the other. A complete set of *advisceral* or of *abvisceral* beats constitutes a *pulsation series*. The intervals between pulsation series are known as *pauses*. An advisceral pulsation series and its pause, followed by an abvisceral series and its pause, form a *compound heart period*.

The numbers of beats in pulsation series were so extraordinarily variable that a normal number could not be found. The total number of abvisceral beats may be considerably more or less than that of the advisceral beats; thus in one case 247 abvisceral beats corresponded to 100 advisceral beats, and in another 237 abviscerals to 523 adviscerals. The rates of the two sets of beats were, however, very close; thus 100 abvisceral beats were accomplished in 175 seconds, and the same number of adviscerals in 174 seconds. As the water in which the animal was kept lost oxygen, the rate of beating increased; thus an individual's heart, which at the beginning of the experiment beat 100 times in 208 seconds, after six hours beat the same number of times in 148 seconds. Of the three species studied, the two larger ones, *Salpa africana-maxima* and *Cyclosalpa pinnata*, had an average rate of 26 to 30 beats per minute; the smaller, *Salpa democratica-mucronata*, 107 per minute. The pauses between ad- and abvisceral series varied from 1 to 4 or occasionally 5 seconds.

Each heart-beat is a peristaltic wave that sweeps over the heart from one end to the other. Usually a new wave appears at one end before the old one has passed off at the other, and sometimes as many as seven waves may be counted on a heart at once. Krukenberg believed that the two ends of the heart were physiologically very different, and that nicotine and hellebore affected the advisceral pulsations only, the former diminishing, the latter increasing them. Schultze, however, found that these poisons influence the ab- as well as the advisceral pulsations, and thus demonstrated that the ends of the heart were not in this respect dissimilar.

[1] Schultze, L. S. Untersuchungen über den Herzschlag der Salpen, *Jenaische Zeitschr. f. Naturwissenschaften*, Bd. xxxv (1901), pp. 221–328, Taf. IX–XI.

The source of the stimulus for the contraction of the heart muscle was sought for in several ways. An isolated heart was found to be capable of beating regularly in either direction. Stimulation of the animal's brain had no effect on the heart-beat. Removal of the brain reduced the rate, but this was shown to be due to the loss of substance suffered by the animal and not to the removal of the brain. The filling of the heart with blood was shown not to be necessary for its contraction. As small fragments of the heart muscle continued to contract rhythmically, and yet on examination showed no evidence of nerve fibres or of ganglion cells, Schultze concluded that the motor stimulus for the action of the heart muscle must be generated exclusively by the metabolism of that muscle itself.

The alternating action of the heart depends on the capacity of its muscle to transmit the stimulus to contraction directly from fibre to fibre and on the varying rhythm of the two ends of the heart. In moribund individuals both ends of the heart may at times give rise to contraction waves simultaneously. These usually meet near the middle of the heart and neutralize one another. In normal individuals the rhythm at one end is so much more rapid than that at the other that this rhythm asserts itself for the whole heart. When, however, the muscle tissue of the given end becomes somewhat exhausted by continued action and thereby reduces its rate of contraction, the muscle substance of the opposite end, having recovered from the effects of its own previous action, may be able to establish a more rapid rate than its opponent, and thus the center of propagation is transferred to the recuperated end. Hence the quiescence of a given end permits that end to recuperate till its own rhythm can supersede that of the opposing end, and its action gradually exhausts it so that its opponent in turn will be able to gain the ascendency.

P.

Flies as Carriers of Disease. — Dr. L. O. Howard, in a recent paper,[1] has presented the possibilities of the transmission of disease by flies in a particularly striking manner. A large number of flies, representing many species, were bred from human excrement. Those seen visiting the same material were collected. Then collections were made in dining-rooms and pantries, and many sheets of sticky fly-paper examined to see what species commonly occur in

[1] A Contribution to the Study of the Insect Fauna of Human Excrement, *Proc. Wash. Acad. Sci.*, vol. ii (1900), pp. 541–604.